Copenhagen emergency call cardiac arrest alert

IMPLEMENTED 2018–2019 · HEALTH AND LIFE SCIENCES · DENMARK · BAND E · PROVED
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A randomised trial on live emergency calls found that an alert from a machine-learning model did not significantly improve dispatchers' recognition of cardiac arrest, even though the model detected more arrests than dispatchers did.

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NOTICE WORDING LAST UPDATED 16 NOVEMBER 2026

AT A GLANCE

No measurable effect: tested, no effect.

AI used: Machine-learning model with speech recognition that listens to emergency calls in real time and alerts the dispatcher when it suspects cardiac arrest.

Implemented: 2018–2019. Grade: band E, No measurable effect, Proved.

Headline result, as reported: In a randomised trial on live 112 calls, dispatchers recognised 93.1% of cardiac arrests with a machine-learning alert and 90.5% without (P = .15), although the model alone had higher sensitivity than dispatchers

1 · The case

The facts, as reported by the 4 sources listed at the end. Where a source is silent, the field says "Not reported".

Organisation

Copenhagen Emergency Medical Services (Capital Region of Denmark). Copenhagen Emergency Medical Services, part of the Capital Region of Denmark, which serves a population of 1.8 million and handles about 130,000 emergency calls a year, per the trial paper. Dispatchers are nurses (70%) and paramedics (30%). Canvas block: 4. Operations and process. Also 6. Data and technology.

Business challenge

The challenge. The authors say emergency medical dispatchers fail to identify about 25% of out-of-hospital cardiac arrests, which costs chances to start cardiopulmonary resuscitation (CPR) early.

How it was addressed. A machine-learning model with speech recognition listened to every call and alerted the dispatcher when it suspected cardiac arrest. Calls the model flagged were randomised 1:1 to an on-screen alert or to normal procedure with the alert suppressed. Dispatchers could heed or ignore an alert. [1] [2] [3] [4]

Who implemented it

In-house (In-house): Copenhagen Emergency Medical Services: Developed and tested the model, sponsored the trial and ran it in its dispatch centre..
Corti (Software vendor): Named in a 2022 paper by Copenhagen Emergency Medical Services authors as the supplier of the speech-recognition software for cardiac arrest detection used at the service..
The trial paper does not name a vendor. It says the model is identical to one described in an earlier study, and the 2022 paper attributes that earlier software to CORTI AI.

Technology (SEAM pillar E)

SEAM types: T8 Predictive / ML models. Deployment: Own infrastructure. Vendors and products: Corti.

Where it was built in: A server running the model was integrated in the network of the Emergency Medical Dispatch Centre in Copenhagen, so alerts could be pushed to the dispatcher's main screen. The model uses speech recognition and estimates cardiac arrest with a one-second resolution during each call.

What changed

Before: dispatchers alone recognised cardiac arrest. In the trial: dispatchers recognised 93.1% of confirmed arrests with the alert and 90.5% without, which was not significant. Time to recognition was about 1.7 minutes in both groups. The model alone recognised 85.0% of arrests against 77.5% for dispatchers, with a positive predictive value of 17.8% against 55.8%. Routine use after the trial: Not reported. [1] [2] [3] [4]

What it cost

Not reported. The authors report that heeding every alert would have dispatched 1,519 more full responses, raising ambulances dispatched from 56,449 to 57,968 (2.7%).

What it saved

Not reported. No time or cost saving was found: dispatcher-assisted CPR instructions started in 64.8% of calls with the alert and 61.9% without (P = .47). [1] [2] [3] [4]

Governance and control

The trial was randomised and masked and was approved by the Danish Patient Safety Authority, per the paper. The registry record was submitted after the trial began; the paper says registration was retrospective. Dispatchers were not obliged to act on alerts. The authors say in

S2 · Accountable owner · Evidenced
Emergency Medical Services, Capital Region, Denmark was the registered sponsor, with a named principal investigator. [4]

A1 · Safe use · Evidenced
The paper reports following the General Data Protection Regulation, registration with the Danish Data Protection Agency and approval by the Danish Patient Safety Authority; the regional research ethics committee waived ethical approval. [1]

A2 · Human in the loop · Evidenced
Dispatchers could ignore or heed an alert and followed a specified protocol when one appeared; the dispatcher's reaction did not affect enrolment or analysis. [1]

A3 · Monitoring and assurance · Evidenced
Randomised, masked trial with calls linked to the Danish Cardiac Arrest Registry and reviewed by masked evaluators; a later paper examined the model's false negatives and false positives. [1] [2]

A4 · Vendor AI · Not reported
Not reported.

A5 · Agent controls · Not reported
Not reported.

A6 · Standards and regulation · Evidenced
The trial followed the CONSORT reporting guideline and was registered on ClinicalTrials.gov, though the paper says registration was retrospective. [1]

What worked, what did not, what is unproven

WORKED

– The model recognised more cardiac arrests than dispatchers: sensitivity 85.0% against 77.5% (P < .001).

– The model's performance in live use was similar to the earlier retrospective study (sensitivity 84.1% and specificity 97.3% then; 85.0% and 97.4% in the trial).

– Had dispatchers heeded every alert, 22 more arrests in the intervention group would have been recognised, about 20 seconds sooner, by the authors' post hoc analysis.

DID NOT

– Dispatcher recognition did not improve significantly with the alert (93.1% against 90.5%, P = .15), and time to recognition and CPR instruction rates did not differ significantly.

– The model raised many false alerts: specificity 97.4% against 99.6%, and positive predictive value 17.8% against 55.8%.

– The authors say dispatchers did not comply with alerts, and that a sensitive model was not enough without confidence in it.

UNPROVEN

– Effect on bystander CPR rates and survival: not measured.

– Whether more training, or a model with fewer false alerts, would lead dispatchers to act on the alert.

– Whether the service uses the model in routine dispatch today: the sources opened do not say.

– Whether the dispatchers in the control group learned from earlier alerts: the authors list this as a possible limit.

Sept 2018 Trial begins at Copenhagen Emergency Medical Services; all 112 calls are processed by the model and calls it suspects as cardiac arrest are randomised to alert or no alert [1]

Dec 2019 Randomisation period ends after about 16 months; the registry record is first submitted that month [4]

Jan 2021 Trial published in JAMA Network Open: no significant improvement in dispatcher recognition [1]

May 2022 A paper by Copenhagen Emergency Medical Services authors refers to an earlier speech-recognition study at the service as being by CORTI AI [3]

2023 Resuscitation paper reviews calls where the model failed or raised false alarms, concluding the language model needs continuous optimisation [2]

2 · Grade and SEAM assessment

MarLuc's opinion, made on the evidence above. How cases are graded: marluc.co.uk/case-studies/how-we-rate

Level of change and impact

Claimed: Not applicable. Grade: E, No measurable effect. Proof: Proved. Level of change: Not graded.

No level assessed: band E, a rigorous trial in live operations in which a model that outperformed dispatchers produced no significant change in dispatcher performance. No harm or withdrawal is reported.

The SEAM view and lessons learnt

A tool can be more accurate than the person it supports and still change nothing, because the result depends on whether the person acts on it. The trial separates model accuracy from the combined result of person and tool. For a larger organisation, the point is to test the whole workflow and not the model alone, to train people to trust and use alerts, and to count false alarms and their downstream cost.

1. Test the combined result of person and tool, not the model alone.
2. Train staff to use alerts and track how often they heed them.
3. Count false alerts and the response they trigger.

Evidence

Score 3 of 4. Independent: peer-reviewed randomised clinical trial in JAMA Network Open (2021), with a registry record and a follow-up paper. Limits: one dispatch centre, servers processed 74.7% of calls, and the control group may have learned from the model.

Evaluation method. Double-masked, 2-group randomised clinical trial (NCT04219306) on all calls to 112 in Denmark handled by Copenhagen Emergency Medical Services, with calls linked to the Danish Cardiac Arrest Registry.

Sources disagree. The trial paper says it was registered retrospectively in August 2019; the

3 · Original sources

Read these in full. To challenge a fact or a grade, use the contact form at marluc.co.uk or the link on https://marluc.co.uk/case-studies/copenhagen-ems-cardiac-arrest-call-alert

[1] JAMA Network Open: Effect of Machine Learning on Dispatcher Recognition of Out-of-Hospital Cardiac Arrest During Calls to Emergency Medical Services, a Randomized Clinical Trial (full text via Europe PMC)
https://www.ebi.ac.uk/europepmc/webservices/rest/PMC7788469/fullTextXML

[2] Resuscitation: When the machine is wrong, characteristics of true and false predictions of out-of-hospital cardiac arrests in emergency calls using a machine-learning model (record via Europe PMC)
https://www.ebi.ac.uk/europepmc/webservices/rest/search?query=%22When%20the%20machine%20is%20wrong%22%20cardiac%20arrest&resultType=core&format=json

[3] Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine: Artificial intelligence in Emergency Medical Services dispatching, potential impact of automatic speech recognition on stroke detection in the Capital Region of Denmark (full text via Europe PMC)
https://www.ebi.ac.uk/europepmc/webservices/rest/PMC9097123/fullTextXML

[4] ClinicalTrials.gov: NCT04219306, Machine Learning Assisted Recognition of Out-of-Hospital Cardiac Arrest During Emergency Calls (registry record)
https://clinicaltrials.gov/api/v2/studies/NCT04219306

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